

northern and southern relatives. And, lastly, they present some features of their own. As an obvious conclusion, we must expect that at some future date it will be possible to show that *canadensis*, *annectens*, and *enhydris* are but subspecies of a single species.

Measurements of the skull of the type (♂) in millimetres:—

Basal length 106·2; greatest breadth 79·8; cranial breadth 63·5; breadth between upper canines 30; interorbital breadth 26; greatest posterior breadth 77·2; palate length 48·7.

Hab. Terro Tepic, Rio de Tepic, Jalisco, Mexico. Coll. Dr. A. C. Bullen, Jan. 1891.

Type Brit. Mus. no. 92. 3. 17. 8.

LXIV.—On the Relations of *Antennophorus Uhlmanni*, Haller, to *Lasius mixtus*, Nyl. By M. CHARLES JANET*.

ANTENNOPHORUS UHLMANNI is an Acarid which was described in 1877 by Haller from specimens found in Switzerland in a nest of *Lasius niger*. Since that time this species has been found by Karpeller in Hungary in a nest of *Lasius umbratus*. These two references are the only ones with which I am acquainted. No observations have been made up to the present on the habits of this creature.

I have found it in abundance in the garden of the Villa des Roses, near Beauvais, in a splendid nest of *Lasius mixtus*, and I took advantage of the opportunity to set up a nest for observation, which has enabled me to ascertain the relations of this parasite with its host.

Antennophorus Uhlmanni lives as an epizoon upon *Lasius*. It fixes itself on the lower surface of the head or on the sides of the abdomen of its host by means of the carunculae in which its feet terminate, and which are furnished with a very adhesive sticky substance.

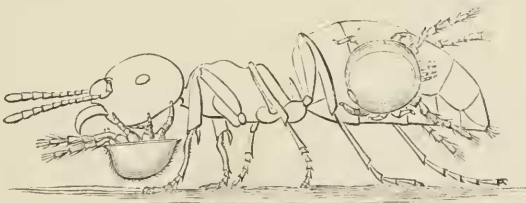
These parasites are blind, but the first pair of feet is transformed into long antenniform appendages provided with very sensitive olfactory organs. They do not wander about in the galleries of the nest, but walk over the bodies of the ants, passing from one to another. When an *Antennophorus*, detached from the body of an ant, lies upon the soil in one of the galleries of the nest, it raises and stretches forward its first pair of ambulatory feet, and at the same time explores the space around it with its long antenniform feet. These

* 'Comptes Rendus,' 1897, t. cxxiv. pp. 583-585.

appendages are much more agitated when an ant passes close by. If it pass near enough, the Acarid glues itself on to its body by means of the cap of sticky material on the end of one of its ambulatory feet, which it holds up ready for this operation; and it can in this way soon climb up and fix itself in a good position on its host. This latter is surprised and seeks to rid itself of the new comer, but, failing in this, it becomes resigned very quickly as soon as the Acarid has taken up one of its normal positions.

Generally a working ant only carries a single *Antennophorus*, but they may very often be seen carrying several. In all cases, the parasites take up positions symmetrical with the sagittal plane of their host's body, and it thus comes about that the centre of gravity of the extra load is placed in the sagittal plane of the carrying ant.

The Acarids are also under the best conditions for not hampering the movements of the ants, and, as a consequence, for being the more readily tolerated by them. The *Antennophorus* directs its antenniform feet towards the front of the ant if fixed upon its head, and in the reverse direction if fixed upon the abdomen. When an ant carries but one *Antennophorus*, it is almost always placed on the head of the host. The case (represented in the figure) of an ant carrying an



Lasius mixtus bearing three *Antennophorus Uhlmanni* in their normal positions. $\times 12$.

Antennophorus under its head and one on either side of the abdomen is very common. The presence of one or more of the parasites on the body of a *Lasius* does not prevent the latter from taking its share in the work of the colony and in particular the carriage of the larvæ and rubbish.

The *Antennophorus* attaches itself freely to the naked nymphs, but never to a nymph enveloped in a cocoon. Thus in an experimental nest consisting of some fifty ants, all carrying a single *Antennophorus* and accompanied by a certain number of nymphs, I found on the following day a newly emerged ant which bore seven *Antennophori* arranged

symmetrically as follows:—two (one on the top of the other) on either side of the head and on the abdomen, one on the middle of the dorsal region, and one on either side. It would appear that the *Antennophorus* is attracted to the young ants on account of the care with which they are looked after and fed by their older companions. These latter do not seek to drive away the parasites, which spread themselves a little later. At the moment when a queen throws off her nymphal envelope the workers come to her assistance, and as the workers carry the *Antennophori*, these latter generally take advantage of the position to pass over to the body of the newly emerged queen.

The *Antennophorus* itself feeds exclusively on the nutritive fluid disgorged by the ants. Fifty *Lasii* carrying *Antennophori* were placed in an observation nest and left without food. Eight days later the ants were in perfect condition, but ten or more *Antennophori* had already died of hunger. A tiny droplet of honey tinted with Prussian blue was allowed to run over the lower face of the glass plate which formed the roof of the nest. A large number of ants, nearly every one of which carried an *Antennophorus*, ranged themselves as closely as they could be packed all round the drop. The *Antennophori* had no share in the meal, and they were obliged to retire a little because there was no room for them between the heads of their hosts and the glass to which they were applied. The ants of this brood had acquired the habit of placing themselves, crowded one against the other, in one corner of the nest, and there they came with their crops well filled after the meal of blue honey, and there they disgorged it before the mouths of their comrades who had had none. Now the ant in the act of disgorging opens its mandibles wide. The peristaltic movements of the œsophagus and the movements of the pharynx brought up the globules of honey, the blue colour of which made them readily visible, and they formed a little drop in front of the mouth. While the fasting ant was eating the honey thus disgorged, the *Antennophorus* riding on its head took its share. To do this it pushed itself forward and thrust its rostrum into the droplet. Generally, while holding itself in position by means of the two hinder pairs of legs, it attached itself by means of the forward pair to the head of the disgorging ant. Very often when the fasting ant had ended its meal and was retiring one would see the *Antennophorus* try to keep its hold on the disgorging ant. The two *Lasii* generally lend themselves to this prolongation of the meal, and, if they are slightly separated from one another, the *Antennophorus* stretches itself to its full

length, and forms, back downwards, a sort of bridge between the heads of the two ants.

If the disgorging ant carries an *Antennophorus* beneath its head, this, too, takes its share in the meal. An *Antennophorus* placed on the abdomen of an ant can also obtain food without quitting its hold. In fact, when another ant comes near it, it seems to understand, by striking it with its antenniform feet and stretching towards it its first pair of ambulatory feet, to ask for and to obtain food.

In conclusion, the *Antennophorus* is a parasite which lives as an epizoon on *Lasius* and feeds upon the nutritive liquid disgorged by the ants. This recalls what I have already described for *Lepismina polypoda* ('Comptes Rendus,' t. cxii. p. 799; see this Journal, 1896, vol. xvii. p. 398); but here we have a case of myrmecophily far more advanced, since the *Antennophorus* feeds itself exclusively on the disgorged liquid, and, further, its presence is regarded as a matter of course by the ant, which gives, even willingly, the food it demands.

LXV.—*Diagnoses of new Land-Shells from Flores, Malay Archipelago.* By EDGAR A. SMITH.

THE species about to be described form part of a valuable collection of land-shells obtained by Mr. A. Everett in South Flores. The typical green form of *Xesta Everetti* is one of the most remarkable shells yet discovered in this or the neighbouring islands.

Xesta Everetti.

Testa turbinata, anguste umbilicata, saturate viridis, versus apicem purpurea, infra suturam albo marginata; spira conoidea; anfractus 7, convexiusculi, lineis incrementi tenuibus, obliquis, arcuatis striati, superiores minute spiraliter striati, ultimus haud descendens; apertura parum obliqua, intus caeruleo-alba; peristoma tenue, margine columellari ad insertionem dilatato albo reflexo.

Diam. maj. 53 millim., min. 43; alt. 50; apertura 30 longa, 27 lata.

Var. Testa viridis, anfr. ultimo et penultimo supra medium rufo obscure zonatis.

Diam. maj. 55 millim., min. 50; alt. 57.

Var. Testa olivaceo-fuscescens.

Diam. maj. 54, min. 46; alt. 50.

Hab. South Flores.

This is an extremely fine species and probably the largest of the genus yet discovered. The very deep green colour of